IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	)	Confirmation No. 5371
Kelly SHOEMAKE *et al*	)	Group Art No. 1771
Serial No.: 10/671,884	)	Examiner: Matthew D. Matzek
Filed: September 29, 2003	)	Docket No: 005242.00133

For: UREA-FORMALDEHYDE BINDER COMPOSITION AND PROCESS

BRIEF ON APPEAL

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Sir:

Appellants submit an original and two copies of this Brief on Appeal. This Brief is submitted pursuant to 37 C.F.R. § 41.37, following the Notice of Appeal filed on December 4, 2005. Also submitted with this Brief is authorization to pay the fee as set forth in 37 C.F.R. §41.20(b)(2). Applicant does not believe any additional fee is due. To the extent a further fee must be paid, please charge our Deposit Account No.19-0733.

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I. REAL PARTY IN INTEREST

The real party in interest in U.S. Application No. 10/671,884 is Georgia-Pacific Resins, Inc. (GPRI). GPRI holds title through an assignment from the inventors. GPRI is a wholly owned subsidiary of Georgia-Pacific Corporation. Georgia-Pacific Corporation is a privately held, indirect wholly owned subsidiary of Koch Industries.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals, interferences, or judicial proceedings.

III. STATUS OF THE CLAIMS

Claims 1-6 and 14-20 stand withdrawn from consideration.

Claims 7-13 are rejected. This rejection is appealed.

IV. STATUS OF AMENDMENTS

The claims were not amended subsequent to the final rejection. Claims 7 and 11 were last amended in a response filed July 12, 2005 in response to the Office Action of April 14, 2005. Claims 8-10 and 12-13 have not been amended.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The subject matter recited in claim 7, the sole independent claim on appeal, is a non-woven, wet laid fiber mat produced by dewatering an aqueous slurry of fibers (¶[22], p. 6; ¶ [26], p. 7 and ¶[27], p. 8). The fibers are bonded together with a cured binder composition that comprises a urea-formaldehyde (UF) resin (¶¶ [29]-[37], pp. 8-10) modified with a protein (¶¶ [38]-[44], pp. 11-12). The protein is provided in an amount of 0.1% to 10% by weight of the UF resin and protein solids (¶ [47], p. 14).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 7-9 and 11-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pub. Appln. 2004/0048531 (Belmares) in view of U.S. Patent 6,384,116 (Chan).

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pub. Appln. 2004/0048531 (Belmares) in view of U.S. Patent 6,384,116 (Chan) and further in view of WO 01/59026 (Trocino).

VII. ARGUMENT

A. The Combination of Belmares with Chan does NOT present a *prima facie* case

The present invention is based on the surprising discovery that the addition of a small amount of a protein additive into a conventional urea-formaldehyde resin binder for making non-woven, wet-laid fiber mats, especially a wet laid fiberglass mat, has a strength enhancing effect on the mat. This strength enhancing effect is analogous to that observed for the previously patented (and commonly owned) invention in which a small amount of a styrene-maleic anhydride (SMA) copolymer is added to such binders (see U.S. Patent 5,914,365 and its divisional U.S. Patent 6,084,021). Indeed, data in the subject application also shows that the combination of both a small amount of protein and a small amount of SMA is particularly and unexpectedly advantageous in such applications.

1. Belmares teaches away from the claimed invention

a. The Belmares product is fundamentally different

Belmares is directed to board or panel products and focuses on formaldehyde resins that are useful as board or panel coatings or as board binders that exhibit low formaldehyde emission. Belmares does not relate to the preparation of a non-woven, wet laid

fiber mat. Belmares boards and panels simply are not analogous to the non-woven, wet laid fiber mats embraced by the claims of the present invention.

A board or a panel is defined as a flat piece of wood or **similarly rigid material** adapted for a special use (emphasis added) (from www.dictionary.com). Belmares also refers to "composite panels" (p. 2, paragraph [0015] of Belmares), which a skilled worker would understand to be a flat piece of rigid material made by pressing together the composite constituents. Indeed, Belmares refers to the product as "building materials like boards made from mineral fiber, wood fiber, fiberglass, as well as particle board or plywood..." (p. 4, paragraph [0045] of Belmares).

In contrast, a mat is defined as a densely woven or thickly tangled mass: *a mat of hair.*, (again from www.dictionary.com). A non-woven, wet laid mat is thus a tangled mass of fibers formed simply by the deposition of the fibers from a slurry (see especially paragraph [22] of the subject application). No pressing is involved and the mat is not rigid.

As is apparent from these contrasting definitions, the panels and boards of Belmares on the one hand and the mats of the present invention on the other do not refer to equivalent structures. A wet laid, non woven fiber mat thus is structurally very different from the composite panels and boards embraced by Belmares teachings. Panels and boards described by Belmares are conventionally prepared by consolidating the board materials under heat and considerable compaction pressure (though we note that Belmares' disclosure regarding the formation of the boards and panels is sorely lacking). In contrast, wet laid mats of the present invention are generally un-compacted, relying principally on the dewatering of a fiber slurry to cause mat formation. A skilled worker simply would not find the teachings of Belmares aimed at composite panels and boards analogous to the very different wet laid mats to which the pending claims are directed.

b. Belmares favors the use of a high level of protein

Belmares uses a polymeric polyamide for a fundamentally different purpose than does the present invention. As a consequence of this, Belmares favors using a much larger

quantity of the polymeric polyamide than is used in the product embraced by the appealed claims.

Belmares specifically describes including a polymeric polyamide as a formaldehyde scavenger in a formaldehyde resin selected from melamine formaldehyde, urea formaldehyde, phenol formaldehyde and their combinations in such coating or board binder compositions.

Belmares polymeric polyamide scavenger may be either a synthetic polyamide or a natural polyamide. The synthetic polyamides may be selected from polyacrylamides, polymethacrylamides, polyamide telomers, copolymers, terpolymers, tetrapolymers, and N-substituted polyamides. Natural polyamides include proteins, such as casein or soy protein. Obviously, only Belmares use of the natural polyamides are relevant to the pending claims.

According to Belmares, the sole purpose of the polymeric polyamide scavenger is to reduce formaldehyde emissions in the coated panels or boards without significantly sacrificing the inherent strength of the panel or board, as occurs when a small molecule scavenger such as urea is used in the coating or binder formulation. "The applied coating with the added scavenger exhibits the same acoustical panel sag performance as one without the scavenger..." page 2, paragraph [0019] of Belmares. There is no disclosure or suggestion that the addition of the scavenger, at any level, improves the strength of the product made in the absence of the scavenger. Belmares simply contends that this "polymeric" class of scavengers is able to reduce formaldehyde emissions without degrading the strength of the composite board as much as small molecule scavengers do.

In the case of protein polyamide scavengers, Belmares indicates that "the effective range for the protein polymeric scavengers is from about 5% to about 50%, from about 10% to about 40% and from about 20% to about 30% (dry weight of scavenger per dry weight of formaldehyde resin) (page 2, paragraph [0023] of Belmares),

Thus, while Belmares, in its broadest aspect, presents an addition level in the range of 5 to 50% for its protein formaldehyde scavenger used in the manufacture of panels and boards, the teachings clearly suggest that levels above 10% and especially above 20% are

preferred. Consistent with the clear suggestion favoring higher levels of the polyamide scavenger, the polymeric additive and especially the protein additive was used in an amount of 25% (by weight) of the formaldehyde resin in Samples 2 and 3 of Belmares illustrative examples. Note that these examples also were limited to the use of a melamine formaldehyde resin. A urea formaldehyde resin (as recited in the appealed claims) was not used. Indeed, in the example presented in paragraphs [0044] through [0046], the use of urea as a scavenger was disparaged.

Belmares does not make it obvious to use what is a significantly lower amount of protein (0.1% to 10% by weight of resin and protein solids in claim 7 and 0.2% to 7% by weight of resin and protein solids in claim 11) in a binder based on a urea-formaldehyde resin for manufacturing a non-woven, wet laid fiber mat.

A skilled worker would not have found it obvious to use protein as an additive in a significantly different application (that is in the manufacture of a wet-laid, non-woven glass mat versus the preparation of a composite board or panel) and at a level of addition below what Belmares prefers and at the lower end of Belmares' broadest taught range, with a reasonable expectation that one would obtain improved strength characteristics in the wet laid mat based on the addition of that small amount of protein.

2. Belmares and Chan are NOT from the same field

Belmares and Chan are not from the same field of endeavor. Indeed, the respective fields of endeavor (composite boards versus wet laid fiber mats) are so disparate that a skilled worker would not have had a reasonable expectation that techniques and compositions relevant to one application would be applicable to the other. Thus, a skilled worker would not consider these teachings in combination.

Chan's invention, like the present invention, is directed to the preparation of a non-woven wet-laid fiber mat. Chan, however, says nothing about protein addition and has no teaching that would in any way suggest that the addition of a protein to a non-woven, wet-laid fiber mat binder would provide any benefit whatsoever. Chan does show that the addition of a water soluble non-ionic amine oxide (and optionally other polymeric additives) to a UF resin

binder, conventionally used to make wet laid glass fiber mats, improves the tear strength of the mat and can improve tensile properties of the mat.

As explained above, Belmares is directed to panel and board products – products that are fundamentally different from the wet laid glass mats made by Chan.

3. Combining Belmares and Chan leads away from the invention

In combining the disclosure of Chan and Belmares in the final rejection, the Examiner asserts that it would have been obvious for an ordinary skilled worker "to modify the article of Belmares et al. and provide it with a binder composition comprising urea-formaldehyde modified with a water-soluble non-ionic amine oxide and optionally further modified with an acrylic latex with the motivation of improving the acoustic insulation panel with improved tensile strength..."

While applicants do not agree that an ordinary skilled worker would be motivated to make such an alteration in Belmares, applicants fail to see the relevance of this contention to the patentability of the pending claims if such a modification were to be made.

First, as explained above the pending claims do not embrace the manufacture of boards or panels. No modification of Belmares, other than a radical modification that completely changes Belmares purpose and focus, would even remotely approach the subject matter of the wet laid mat defined by the pending claims. Using Chan's binder for making Belmares' product still produces a board or panel – not a wet laid mat.

Secondly, in making such a combination, it would appear that the optionally fortified amine oxide additive used in Chan's binder would need to replace the polyamide scavenger (protein) of Belmares, if improved tear and tensile properties are the desired result. Chan clearly teaches that it is the optionally fortified amine oxide additive that produces the strength improvements in the mat. No teaching in Chan would suggest that the protein additive should be retained. As explained above, even Belmares does not teach that the addition of protein improves the strength of the board treated with the binder. The combined teachings of these references do not lead to the claimed invention.

B. The Invention Exhibits Unexpected Results

U.S. Patents 5,914,365 and 6,084,021 are directed to the preparation of non-woven wet-laid fiber mats, just as is the present invention. While these patents do not have any teaching that would in any way suggest that the addition of protein to a non-woven, wet-laid fiber mat binder would provide any benefit whatsoever, these patents do show that the addition of a small amount of SMA copolymer to a UF resin binder, conventionally used to make glass fiber mats, significantly improves the tear strength and the Dry and Hot-wet tensile properties of the mat relative to a mat prepared with the non-SMA modified UF binder resin. In particular, the data reported in Tables 1A, 1B, 1C, 1D, 1E, 2, 3, 4 and 5 of these patents show a consistent pattern that the addition of as little as 0.1% SMA to the UF resin binder provides a measurable improvement in the tear strength and tensile properties of the glass mats. Indeed, that showing was the basis on which the Chang patents were granted.

Data in Tables 1, 2 and 3 of the subject application, in turn, demonstrate that a minor level of protein addition to a UF binder resin can replace all or a part of the SMA additive with equivalent strength results for the mat. Thus, when the showing from the Chang patents (that a binder based on SMA plus a conventional UF resin provides unexpectedly superior mat strength properties versus a binder based on a conventional UF resin alone) is coupled with the data presented in the subject application (showing that a binder having a minor level of protein addition to a UF binder resin can replace all or a part of the SMA additive with equivalent strength results for the mat), a skilled worker readily recognizes that the addition of a small amount of soy protein to a binder comprising a conventional UF resin results in unexpectedly superior mat strength properties versus a binder based on a conventional UF resin alone. Such strength improvements are not disclosed or suggested by the prior art.

C. The Combination of Trocino with Belmares and Chan does NOT present a *prima facie* case

Trocino describes making a protein-based adhesive by functionalizing a denatured (hydrolyzed) vegetable protein with methylol groups (e.g., treat the protein with formaldehyde),

and then reacting the functionalized protein with a co-monomer having methylol groups (e.g., dimethylolurea or dimethylolphenol). Like Belmares, Trocino uses the adhesive in the formation of composite boards, unlike Belmares, Trocino uses the functionalized soy component as the major constituent of the binder (in the examples the soy additive was 50% or more of the adhesive solids). Surely, the level at which the soy additive is used in Trocino's binder is far removed from the upper limit (10%) for protein usage in the wet laid fiber mat binder embraced by the pending claims, such that Trocino does not remedy any of the deficiencies of Belmares.

The rejection relying in part on Trocino also fails to provide an appropriate basis for combining the references. In Belmares, the protein is added solely as a formaldehyde scavenger. In Trocino, the protein is the main structural constituent of the adhesive formulation. A skilled worker would not consider the teachings of Trocino in connection with Belmares. The only similarity between the two is that they both relate to the making of composite boards. However, this similarity constitutes one of the main distinctions between these references and the pending claims. As noted above, a skilled worker would not consider teachings directed to composite panels and boards to have any relevance for non-woven, wet laid fiber mats. Trocino also is a non-analogous reference.

Indeed, it is this fundamental distinction between the Belmares and Trocino references on the one hand, and the Chan reference and the present invention on the other hand, that the Examiner has erroneously ignored. The Examiner has flatly asserted that each of the prior art references "are directed for use in the construction of fiberboard panels." That is plainly incorrect. While Belmares and Trocino describe the construction of fiberboard panels, Chan and the present invention do not. Chan and the present invention describe the preparation of wet laid mats. These products are not the same and they are not analogous.

D. Conclusion

Based on the cited references, a skilled worker would not have found it obvious to use protein as an additive for a UF resin binder in wet-laid, non-woven glass mat, particularly at a level of addition well below what Belmares prefers in connection with composite boards, with

a reasonable expectation that one would obtain improved strength characteristics in the wet laid mat based on the addition of that small amount of protein.

For this reason and the reasons given above, the final rejections of claims 7-13 should be reversed.

February 4, 2006

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VIII. CLAIMS APPENDIX

Claims involved in the appeal:

1. (Withdrawn) A binder composition comprising a urea-formaldehyde resin, prepared at a formaldehyde to urea mole ratio in the range of about 2.1:1 to 3.2:1, modified with a protein, said protein provided in an amount of 0.1% to 10% by weight of urea-formaldehyde resin solids.

2. (Withdrawn) The binder composition of claim 1 wherein the protein is a vegetable protein.

3. (Withdrawn) The binder of claim 2 wherein the vegetable protein is a soy protein.

4. (Withdrawn) The binder of claim 3 wherein the soy protein is a soy flour and having a final formaldehyde to urea mole ratio in the range of about 1.4:1 to about 2.3:1.

5. (Withdrawn) The binder of claim 4 having the soy flour in an amount of about 0.2% to about 7% by weight of urea-formaldehyde resin solids.

6. (Withdrawn) The binder of claim 1 comprising a binder modifier selected from the group consisting of a styrene-maleic anhydrde copolymer; a non-ionic amine oxide, optionally with a latex or a water-soluble polymer; a water-insoluble anionic phosphate ester and a fatty alcohol; and a styrene/acrylate/acrylonitrile polymer, supplemented with a polysiloxane.

7. (Previously presented) A non-woven, wet laid fiber mat produced by dewatering an aqueous slurry of fibers, the fibers being bonded together with a cured binder composition comprising a urea-formaldehyde resin modified with a protein, said protein provided in an amount of 0.1% to 10% by weight of resin and protein solids.

8. (Original) The fiber mat of claim 7 wherein the protein is a vegetable protein.

9. (Original) The fiber mat of claim 8 wherein the vegetable protein is a soy protein.

10. (Original) The fiber mat of claim 9 wherein the soy protein is a soy flour.

11. (Previously presented) The fiber mat of claim 10 having the soy flour in an amount of about 0.2% to about 7% by weight of urea-formaldehyde resin and protein solids.

12. (Original) The fiber mat of claim 11 made using glass fibers.

13. (Original) The fiber mat of claim 7 wherein the binder comprises a binder modifier selected from the group consisting of a styrene-maleic anhydrde copolymer; a non-ionic amine oxide, optionally with a latex or a water-soluble polymer; a water-insoluble anionic phosphate ester and a fatty alcohol; and a styrene/acrylate/acrylonitrile polymer, supplemented with a polysiloxane.

14. (Withdrawn) A process for making a fiber mat comprising (a) forming an aqueous dispersion of fibers; (b) passing the dispersion through a mat forming screen to form a wet non-woven mat and (c) applying a binder composition to the wet non-woven mat, the binder composition comprising a urea-formaldehyde resin modified with a protein, said protein provided in an amount of 0.1% to 10% by weight of resin solids.

15. (Withdrawn) The process of claim 14 wherein the protein is a vegetable protein.

16. (Withdrawn) The process of claim 15 wherein the vegetable protein is a soy protein.

17. (Withdrawn) The process of claim 16 wherein the soy protein is a soy flour.

18. (Withdrawn) The process of claim 17 having the soy flour in an amount of about 0.2% to about 7% by weight of urea-formaldehyde resin solids

19. (Withdrawn) The process of claim 18 wherein the fibers are glass fibers.

20. (Withdrawn) The process of claim 14 wherein the binder comprises a binder modifier selected from the group consisting of a styrene-maleic anhydrde copolymer; a non-ionic amine oxide, optionally with a latex or a water-soluble polymer; a water-insoluble anionic phosphate ester and a fatty alcohol; and a styrene/acrylate/acrylonitrile polymer, supplemented with a polysiloxane.

IX. EVIDENCE APPENDIX

1. Chang U.S. Patent 5,914,365

   a) Identified in Information Disclosure Statement dated August 5, 2004

   b) Considered by Examiner – paper attached to Final Office Action of August 4, 2005

   c) Part of argument in paper filed November 2, 2005 (pages 6-7)

   d) Argument considered by Examiner – Box 11 checked in Advisory Action of November 21, 2005

2. Chang U.S. Patent and 6,084,021

   a) Identified in Information Disclosure Statement dated August 5, 2004

   b) Considered by Examiner – paper attached to Final Office Action of August 4, 2005

   c) Part of argument in paper filed November 2, 2005 (pages 6-7)

   d) Argument considered by Examiner – Box 11 checked in Advisory Action of November 21, 2005

3. www.dictionary.com

   a) Part of argument in paper filed November 2, 2005 (page 8)

   b) Argument considered by Examiner – Box 11 checked in Advisory Action of November 21, 2005

www.dictionary.com

board Pronunciation Key (bôrd, bo͝rd)
n.

1. A long flat slab of sawed lumber; a plank.
2. A flat piece of wood or similarly rigid material adapted for a special use.
3. *Games.* A flat surface on which a game is played.
4. The hard cover of a book.
5. **boards** A theater stage.
6.
    a. A table, especially one set for serving food.
    b. Food or meals considered as a whole: *board and lodging.*
7. A table at which official meetings are held; a council table.
8. An organized body of administrators or investigators: *a board of trustees; a board of directors.*
9. An electrical-equipment panel.
10. *Computer Science.* A circuit board.
11. *Sports.*
    a. A scoreboard.
    b. A tote board.
    c. **boards** The wooden structure enclosing an ice hockey rink.
    d. A diving board.
    e. A surfboard.
    f. A snowboard.
12. *Basketball.*
    a. A backboard.
    b. A rebound.
13. *Nautical.*
    a. The side of a ship.
    b. A leeboard.
    c. A centerboard.
14. *Obsolete.* A border or an edge.
15. A usually large, vertically positioned flat surface used for writing or posting, especially:
    a. A blackboard.
    b. A bulletin board.

mat[1] Pronunciation Key (măt)
n.

1. A flat piece of coarse fabric or other material used for wiping one's shoes or feet, or in various other forms as a floor covering.
2. A small flat piece of decorated material placed under a lamp, dish of food, or other object.
3. *Sports.* A floor pad to protect athletes, as in wrestling or gymnastics.

4. A densely woven or thickly tangled mass: *a mat of hair.*
5. The solid part of a lace design.
6. A heavy woven net of rope or wire cable placed over a blasting site to keep debris from scattering.

X. RELATED PROCEEDINGS APPENDIX

There are no related proceedings.